Formosan Journal of Surgery (2016) 49, 15—19

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CASE REPORT

Extensor-pollicis-longus or -brevis tendon rupture after corticosteroid injection

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Received 27 May 2015; received in revised form 1 June 2015; accepted 23 June 2015
Available online 15 January 2016

KEYWORDS
corticosteroid injection;
extensor-pollicis-brevis tendon;
extensor-pollicis-longus tendon;
tendon transfer

Summary Corticosteroids have been used for treating various musculoskeletal problems for more than five decades. They remain the drug of choice in rheumatology, orthopedics, and other areas. Most local corticosteroid injections are safe; however, complications may occasionally arise. Tendon rupture is uncommon after a local corticosteroid injection. We present two cases and review possible rupture mechanisms. In case 1, the patient presented with a painful swelling on the dorsal side of her right first metacarpophalangeal joint. An orthopedic surgeon prescribed three local corticosteroid injections over 4 weeks, and the patient experienced a sudden loss of extension on the distal phalanx of her thumb 3 weeks after the last injection. Two days later, the proximal phalanx of the thumb lost its extension. Surgical exploration revealed that the extensor-pollicis-longus and extensor-pollicis-brevis tendons were completely severed. Both tendon ends had edematous necrosis with collagen degeneration. In case 2, the patient presented with ruptures of the extensor-pollicis-brevis tendon and the radial collateral ligament of her first metacarpal joint after receiving a local corticosteroid injection. In case 1, functional recovery was achieved by repairing the extensor-pollicis-brevis tendon and by transferring the extensor indicis proprius tendon to the extensor pollicis longus. In case 2, the patient was lost to follow-up and did not undergo surgery. Most physicians overlook local-corticosteroid-injection-induced tendon injuries. We hope that such patients will alert all physicians to the risk of tendon rupture associated with corticosteroid injections.

Conflicts of interest: All contributing authors declare no conflicts of interest.

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http://dx.doi.org/10.1016/j.fjs.2015.06.006

1. Introduction

For over half a century, corticosteroids have been used for treating different musculoskeletal disorders, such as rheumatoid arthritis, tendinitis, and idiopathic myofascial pain. Although corticosteroids are effective for relieving symptoms, complications may arise. Most complications lead to minor complaints, such as pain or skin discoloration, which require no further management. However, certain complications are severe, such as gastrointestinal bleeding, and require further intervention.[1,2]

Many physicians prefer local rather than systemic administration of corticosteroids if the lesion is limited to a specific region, because of a high local therapeutic concentration and to avoid undesirable side effects, such as elevated blood-glucose levels, hypertension, Cushing syndrome, and gastrointestinal hemorrhage. Under most circumstances, a local corticosteroid injection is safe. However, improper administration can cause problems, such as ruptured tendons.

Spontaneous rupture of the extensor-pollicis-longus (EPL) tendons typically occurs in cases with a bony deformity after a traumatic injury or chronic arthritis. In addition, nontraumatic scenarios, such as rheumatoid-arthritis-induced chronic inflammation, can lead to ruptured tendons. Spontaneous tendon severance at the injection site after receiving a local corticosteroid injection has been reported in the literature.[1,3–5] However, we believe the incidence to be underestimated because the injection is always administered in response to a musculoskeletal complaint, and the association between the ruptured tendon and injection is difficult to confirm beyond a correlation. Therefore, by presenting our case reports, we intend to raise physicians' awareness of the risks of tendon injury after the administration of a local corticosteroid injection.

2. Case reports

2.1. Case 1

A 76-year-old woman without any apparent underlying disease presented with a sudden loss of extension on the distal phalanx of her right thumb. Six months prior to this event, she had experienced intermittent painful swelling with a slight erythematous change on her right dorsal first metacarpophalangeal (MP) joint. She visited a local orthopedic clinic, where the orthopedic surgeon prescribed three local corticosteroid injections over 4 weeks, and her swelling subsided thereafter. The patient did not experience any significant side effects during or immediately after treatment.

However, 3 weeks after the last corticosteroid injection, the patient experienced a sudden loss of extension of the distal phalanx on her right thumb. Two days later, she lost the extension of the proximal phalanx on the same thumb (Figure 1). The passive range of motion on the interphalangeal and MP joints of her right thumb was unremarkable. She subsequently visited our outpatient clinic to seek

Figure 1 The patient was unable to extend the interphalangeal and metacarpophalangeal joints of her right thumb 3 weeks after receiving a local corticosteroid injection.

treatment for her affected thumb. We suspected that the EPL and extensor-pollicis-brevis (EPB) tendons were ruptured. An X-ray revealed an unremarkable MP joint and a smooth bony surface, which excluded an osteogenic cause for the spontaneous tendon rupture. To investigate the problem and repair the tendons, we performed exploratory surgery.

After exploring the dorsal aspect of the right first MP joint, we identified the severed tendons (Figure 2). The distal end of the EPL tendon had edematous necrosis with collagen degeneration. The proximal stump of the EPL tendon had retracted and was not found. Furthermore, the EPB tendon had undergone edematous degeneration, and had ruptured close to its insertion point on the proximal phalanx of the thumb. To investigate the possible pathophysiology of the tendon ruptures, we examined the soft tissue around the joint, but did not find direct evidence of

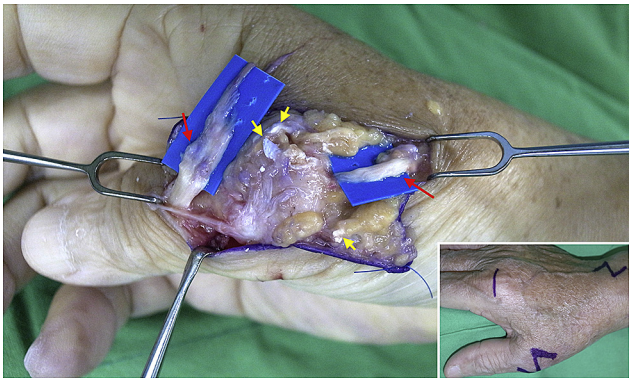

Figure 2 Upon exploration, the distal end of the extensor-pollicis-longus tendon and the proximal stump of the extensor-pollicis-brevis tendon were identified (red arrows). The proximal stump of the extensor-pollicis-longus tendon was unavailable because it had retracted into the patient's forearm. All ruptured tendon stumps had edematous necrosis with collagen degeneration. White debris (yellow arrows) was distributed across the tendon route. A pathological examination confirmed that the debris was tendon tissue. The ink marks on the hand in the lower-right inset indicate the incision spots marked for exploration and tendon transfer.

gouty arthritis or any chronic inflammatory disease. Only the debris of the ruptured tendons was found in the original paths.

Because of the long segmental necrosis of the EPL tendon and the retraction of its proximal stump, primary repair of this tendon was not possible. Therefore, we transferred the extensor-indicis-proprius (EIP) tendon to the EPL tendon to restore the extension of the thumb by adjusting the EIP tension appropriately (Figures 3A and 3B). The EPB tendon was repaired using direct 4-0 nonabsorbable sutures (Figure 3C). The patient recovered well and regained the extension of her right thumb (Figure 4). No recurrent joint pain or tendon rupture was observed during the subsequent 15-month follow-up period.

A pathological examination revealed degenerative collagen bundles of varying thickness and partial myxoid degeneration, but the tissue was free of inflammatory cell infiltration (Figure 5A). In addition, the foci of necrosis and deposits of amorphous eosinophilic material mixed with a few neutrophils, lymphocytes, and histiocytes were observed (Figure 5B).

2.2. Case 2

A 46-year-old woman visited our outpatient department because of an ulnar deviation of the first MP joint on her right thumb (Figure 6). A physical examination suggested that the EPB tendon and the collateral ligament on the radial side were ruptured. There was no open wound or scar around the MP joint. She denied a history of trauma on her right first MP joint. However, she reported erythematous painful swelling that had occurred 3 months prior to her visit, for which she had visited a local medical clinic and received a local corticosteroid injection. The painful swelling on her right first MP joint improved gradually. However, an ulnar deviation developed and progressed. The patient said that the corticosteroid had been injected into the dorsolateral aspect of the MP joint, which was near the radial collateral ligament and the EPB tendon insertion point in the proximal phalanx of the thumb. Her skin discoloration was compatible with her symptoms. The patient visited our clinic 6 weeks after her last injection to receive treatment for the ulnar deviation of her thumb. Surgical exploration and tendon repair were suggested. However, the patient expressed hesitation regarding the procedure, and eventually decided against the recommendation and was lost to follow-up.

3. Discussion

EPL tendon ruptures have been discussed at length in the literature, and the three major etiologies are trauma with a distal radial fracture, trauma without a fracture, and spontaneous rupture. Most EPL tendon ruptures are caused by a distal radial fracture.[6] Mechanical friction and contusions are adequate explanations as to why tendons rupture in trauma cases with or without a fracture. However, a spontaneous rupture is more complex than the other conditions, and has diverse etiologies (e.g., chronic inflammatory diseases, such as systemic lupus erythematosus).

Spontaneous rupture of the EPL tendon was first described in 1876.[7] It was associated with rheumatoid arthritis, diabetes mellitus, uremia, and other chronic inflammatory conditions. Since the 1980s, many case reports[3–6,8–10] have revealed an association between local corticosteroid injections and the spontaneous rupture of different tendons, such as the Achilles tendon, patellar tendon, and digit tendons (i.e., the EPL). Most spontaneous ruptures have been reported in patients who received repeated local corticosteroid injections. Therefore, the

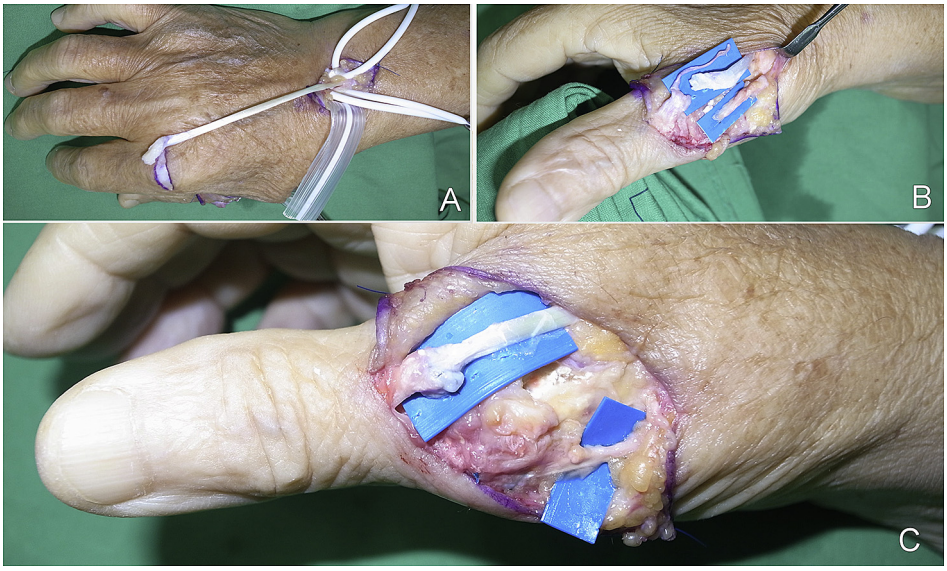

Figure 3 (A) The extensor-indicis-proprius (EIP) tendon was elevated for tendon transfer. (B) The extensor-indicis-proprius tendon was transferred to the extensor-pollicis-longus tendon via the subcutaneous route. After the distal necrotic tendon was trimmed, the extensor-pollicis-longus tendon was sutured with the transferred extensor-indicis-proprius tendon by using 4-0 nonabsorbable sutures. (C) The extensor-pollicis-brevis tendon was repaired directly.

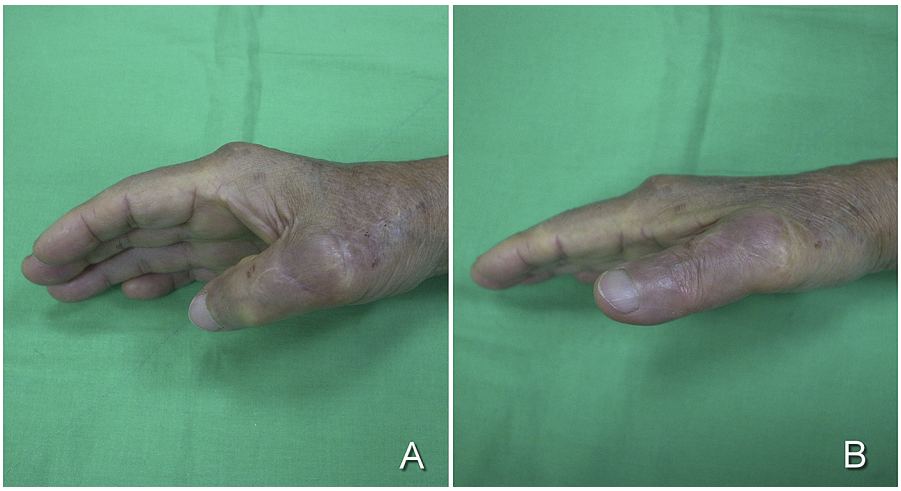

Figure 4 (A) Flexion and (B) extension of both the interphalangeal and metacarpophalangeal joints of the patient's right thumb at the 1-year follow-up.

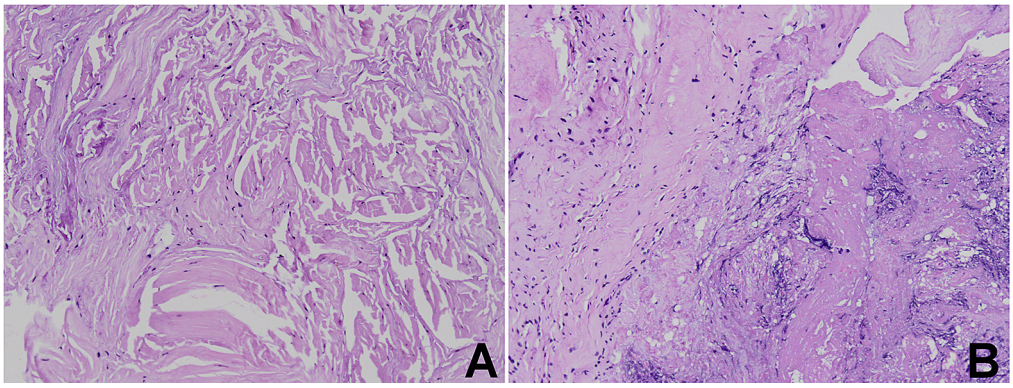

Figure 5 (A) Degenerative collagen bundles were characterized by varying thickness and partial myxoid changes, but were free of infiltrating inflammatory cells (100×). (B) Foci of necrosis and deposits of amorphous eosinophilic material mixed with a few neutrophils, lymphocytes, and histiocytes were observed (100×).

frequency of corticosteroid injections is considered the most crucial predisposing factor for spontaneous tendon rupture after local-corticosteroid-injection administration. However, in addition to frequency, other factors might be substantially involved in such complications. For example, a pathological examination in a case report[5] on the rupture of the common extensor tendon after the administration of a single local corticosteroid injection revealed noninflammatory collagen degeneration. This observation differed from other chronic inflammatory conditions that might rupture the tendon. One hypothesis expressed in a literature review[11] was that if the corticosteroid injection is intratendinous, it is highly likely to damage the tendon tissue. Furthermore, an animal study[12] reported that intratendinous injections of hydrocortisone led to the separation and necrosis of collagen bundles at 45-min post-injection, and reduced the load required for a tendon rupture. Therefore, when a corticosteroid injection is administered, the injection site is crucial.

Figure 6 Ulnar deviation of the first metacarpophalangeal joint in the right thumb of case 2 after a local corticosteroid injection for treating joint pain. The red arrow indicates the injection site and skin discoloration.

Both of our patients received local corticosteroid injections for joint pain. They denied a history of rheumatoid and gouty arthritis, and similar symptoms on other joints. In case 1, we did not find tophus or spur formations during surgery, and only ruptured and degenerated tendon tissue was observed, which can be caused only by endogenous factors, such as corticosteroid injections. Most tendon ruptures occur between a few days and 6 weeks'

postinjection.[3] In our cases, the ruptures occurred 3 weeks after the last injection in case 1, and 6 weeks after the injection in case 2, which were compatible with the previous findings. However, in case 1, a pathological examination of the tendon tissue revealed neutrophil aggregation, which differed from that of noninflammatory collagen degeneration in the case report[5] on the rupture of the common extensor tendon. Nevertheless, the pathological presentation of tendon specimens after corticosteroid injections remains debatable. Additional pathological studies are required to determine the mechanism that leads to a tendon rupture after the administration of a corticosteroid injection.

Treatment options for EPL tendon ruptures include direct repair, tendon grafting, and tendon transfer. Two decades ago, EIP tendon transfer was recommended[13] as the most reliable procedure for restoring original EPL function. In case 1, direct repair or a tendon graft was not possible because the ruptured EPL tendon had retracted into the forearm. EIP tendon transfer was conducted because the tendon was aligned in the appropriate direction and has more excursion. This technique can be performed reliably, requires postoperative reeducation for a certain period, and has few associated complications.

The incidence of spontaneous tendon rupture after a local corticosteroid injection has been underestimated, because the mechanism between a tendon rupture and a corticosteroid injection remains unknown. Nevertheless, plastic and orthopedic surgeons might find themselves managing many patients with such problems. In most instances, a ruptured tendon might be attributable to a bony anomaly, such as a coarse bony surface and spur, which are secondary to osteoarthritis, for which the adverse effects of a local corticosteroid injection are easily ignored.

In conclusion, local corticosteroid injections are widely accepted and generally successful in treating tendinitis and other musculoskeletal problems. They are usually safe and have a low complication rate, which is why they are used extensively in medical centers and local clinics by surgeons and general practitioners alike. These two cases, however, are examples of a serious undesirable side effect of a local corticosteroid injection. The frequency of the injections and the precise location of the injection site are critical for avoiding tendon ruptures. Intratendinous corticosteroid injections might have a high risk of tendon rupture, and should thus be avoided.

Acknowledgments

The authors thank Dr Cheng-Lin Wu, a pathologist at National Cheng Kung University Hospital, for assisting with the study.

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